Mixed Design Model for the Acquisition of English Vocabulary

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Overview:

- Introduction topic
- Information about the data
- Research question and hypotheses
- Statistical analysis
- Results
- Conclusion

Introduction topic (1):

- General advantage of bilinguals
- During linguistic and non-linguistic tasks
- Also with language acquisition
- Bilinguals' brain structure might have a facilitative function during the acquisition of foreign languages

Introduction topic (2):

- "Bilingualism has a positive effect on foreign language achievement" (Garate & Iragui, 1993, p. 13)
- Look at whether there is a difference in the acquisition of English vocabulary between monolinguals and bilinguals, or differences due to the extent of bilingualism

Scholarly significance:

- Whether there exist differences in the processing of a third language
- Due to two measurements, possible differences over time
- Whether being raised bilingually has a positive effect on further foreign language acquisition and what kind of effect this might have on the manner in which foreign languages are taught in schools

Data (1):

- Data from Mirjam Günther
- PhD project
- Whether the extent of bilingualism has an influence on the acquisition of English as a third language
- Using the Paul Meara English Vocabulary Test

Data (2):

- 77 participants
- First-year HAVO/VWO students
- Three different schools: Leeuwarden (PJA)/Balk (CSG)/Sneek (BGM)
- Frisian L1 or Dutch L1
- Also gender, date of birth and CITO score
- Three measurements: October 2012, February 2013 and June 2013
  ◦ All three schools participated in the last two measurements, so only measurement 2 and 3 (N = 67)

Data (3):

- Paul Meara Vocabulary Test includes 20 tests for each of the 5 levels

- Every measurement a test on level 1 and level 2

- Only using the scores of the level 1 tests for the last two measurements to determine whether the students improved over time (repeated measures)

Data (4):

- level 1 represents a basic level of competence
- Every test takes around 3 minutes to complete and contains 60 items
- Contains 40 real words and 20 non-existent, imaginary words
- To decide whether (s)he knows the word or not, and to mark the word with a Y or an N
- Resulting scores are percentages: a score of 75 means that that participant knows 75% of the basic English vocabulary

Data (5):

- The students' score as dependent variable
- Using the time measurements (2), their L1 (Dutch/Frisian), gender (male/female) and school (PJA/CSG/BGM) as independent variables
- Time measurement as a repeated measures

Research question:

- To what extent do the variables time measurement, L1, gender and school influence the score of the participants and significantly affect the student's acquisition of English vocabulary?

Hypotheses (1):

- H_1: Acquisition of more English vocabulary over time, hence the students might have better scores during measurement 2 than during measurement 1

- H_2: Advantage of bilinguals over monolinguals, hence the L1 Frisian students might have an advantage over the L1 Dutch students and might have better scores than the L1 Dutch students

Hypotheses (2):

- H_3: Due to the assumed female superiority in language acquisition, it might be the case that the girls show better results than the boys (see e.g., Beiser & Hou, 2000; Yawen, 2004)

- H_4: Since all the three schools are in Frisia and all three schools teach Frisian as a course, it might be interesting to see whether there exist any differences here and whether the students differ in their score for the vocabulary test

>> Also interested in the various interactions between these variables

Analysis (1):

|	Participant	L1	Gender	School	Measurement_Time	Score
1	1	Dutch	Girl	PJA	Measurement_Time1	65
68	1	Dutch	Girl	PJA	Measurement_Time2	42
2	2	Dutch	Boy	PJA	Measurement_Time1	78
69	2	Dutch	Boy	PJA	Measurement_Time2	75
3	3	Dutch	Boy	PJA	Measurement_Time1	58
70	3	Dutch	Boy	PJA	Measurement_Time2	47
4	4	Dutch	Boy	PJA	Measurement_Time1	87
71	4	Dutch	Boy	PJA	Measurement_Time2	85
5	5	Dutch	Girl	PJA	Measurement_Time1	61
72	5	Dutch	Girl	PJA	Measurement_Time2	76
6	6	Dutch	Girl	PJA	Measurement_Time1	63
73	6	Dutch	Girl	PJA	Measurement_Time2	85
7	7	Dutch	Boy	PJA	Measurement_Time1	84
74	7	Dutch	Boy	PJA	Measurement_Time2	60
8	8	Frisian	Girl	PJA	Measurement_Time1	24
75	8	Frisian	Girl	PJA	Measurement_Time2	64
9	9	Dutch	Boy	PJA	Measurement_Time1	78
76	9	Dutch	Boy	PJA	Measurement_Time2	80
10	10	Frisian	Boy	PJA	Measurement_Time1	81
77	10	Frisian	Boy	PJA	Measurement_Time2	87

Analysis (2) – Bar Charts:
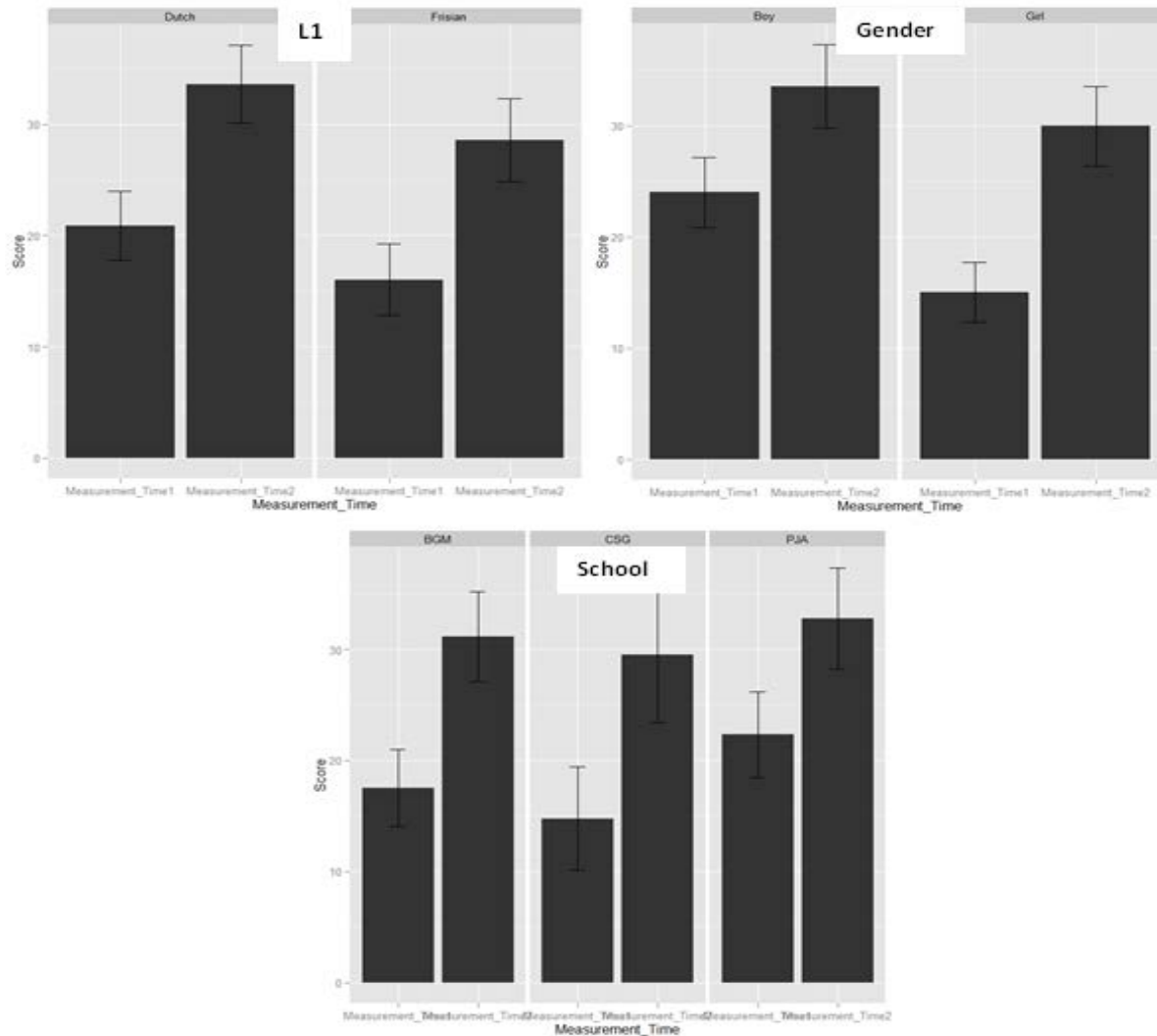
Analysis (3) – Observations:

- In all the bar charts, measurement 2 higher than measurement 1
- Dutch L1 speakers seem to be somewhat better than Frisian L1 speakers
- Male speakers seem to be somewhat better than female speakers
- Does not seem to be much difference between the three schools. PJA seems to be a little bit higher than BGM and CSG, and CSG seems to have the lowest score

Analysis (4) – Boxplots:
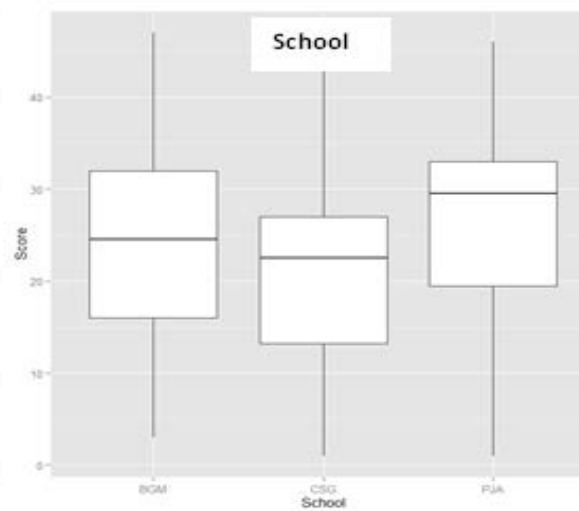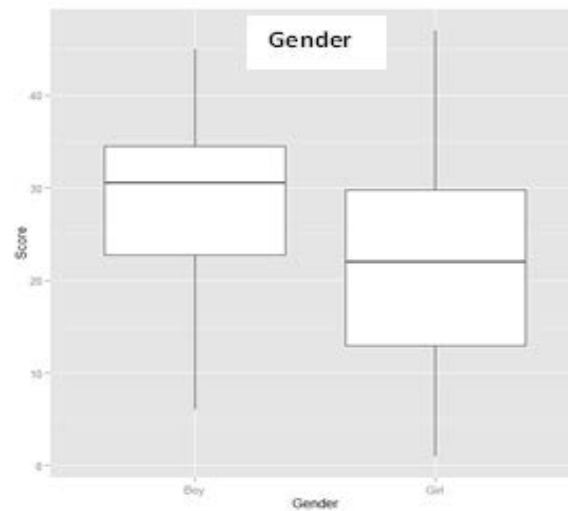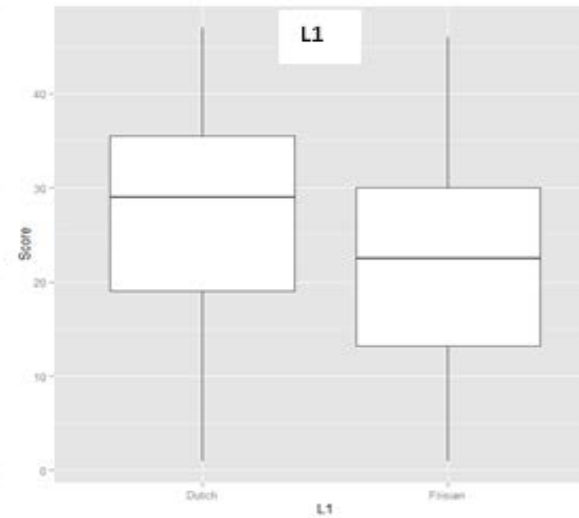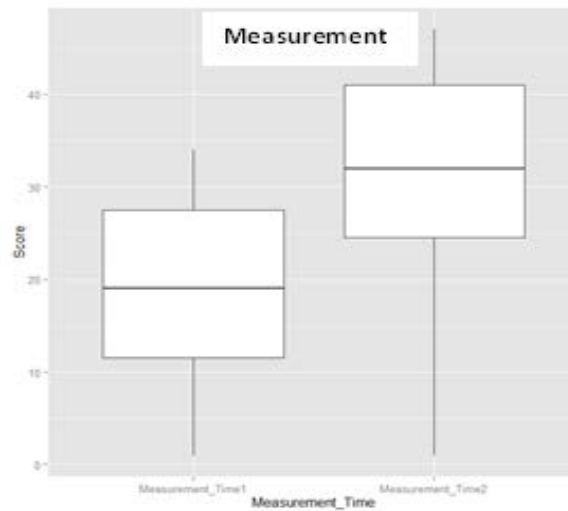
Analysis (5) – Observations:

- It is almost certain that measurement 2 significantly differs from measurement 1
- Dutch L1 speakers might significantly differ from Frisian L1 speakers
- Male speakers might significantly differ from female speakers
- The schools do not seem to differ a lot, so there might not be any significant differences here

Analysis (6) – Normality:
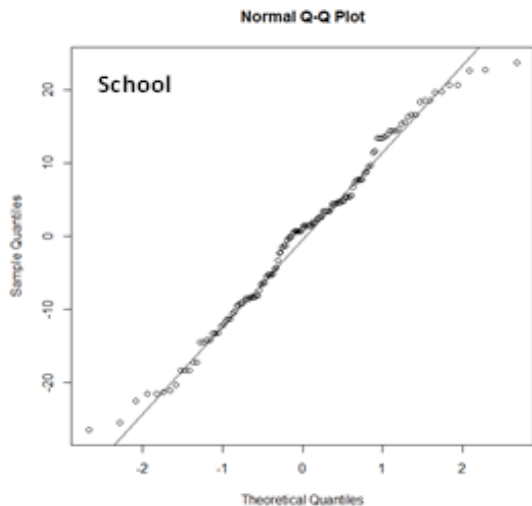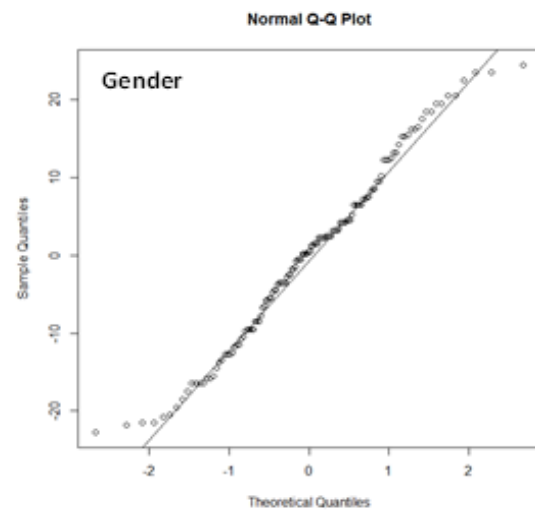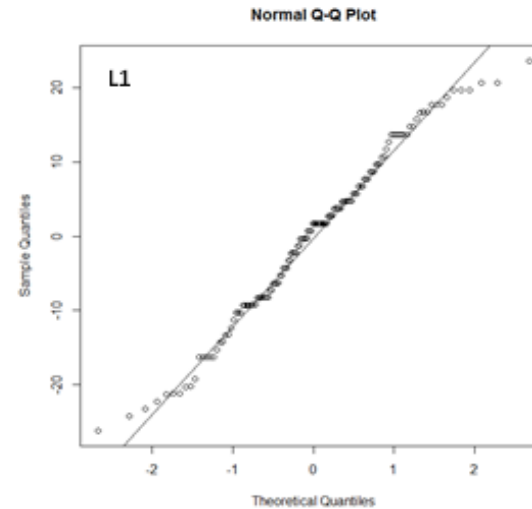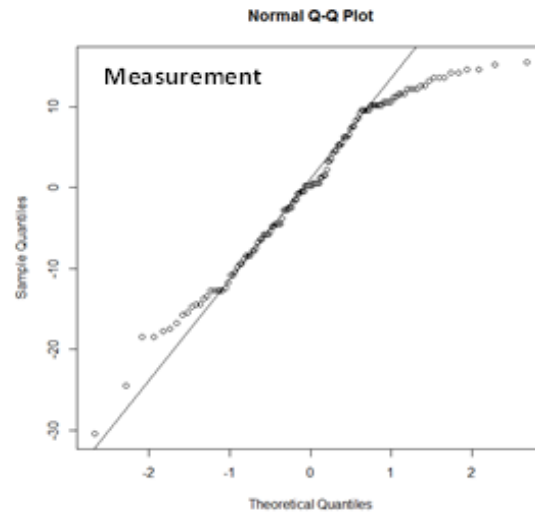
Analysis (7) – Mixed Design Model:

- Start with the baseline model, with only the intercept, which is Score

- Then seperately adding the variables, which are L1, Gender and School

- Then seperately adding the interactions

- Looking at the AIC and the p-value to decide whether the variables or interactions significantly contribute to the model

Analysis (8) – Mixed Design Model:

	Model	Df	AIC	BIC	logLik	L.Ratio	p-value
Baseline	1	4	1048.7979	1060.3892	-520.3989		
MeasurementM	2	5	988.2667	1002.7559	-489.1334	62.53117	<.0001
L1M	3	6	984.4684	1001.8554	-486.2342	5.79835	0.0160
GenderM	4	7	977.1222	997.4071	-481.5611	9.34618	0.0022
Measurement_Time_L1	5	8	979.1151	1002.2978	-481.5576	0.00707	0.9330
Measurement_Time_Gender	6	9	976.3583	1002.4389	-479.1792	4.75679	0.0292
L1_Gender	7	10	973.9534	1002.9318	-476.9767	4.40497	0.0358
MearaModel	8	11	975.6377	1007.5139	-476.8188	0.31566	0.5742

Results (1):

- Measurement_Time variable:

The participants performed significantly better at measurement 2 (M = 31.4477612; SD = 10.6091493) than measurement 1 (M = 18.7761194; SD = 9.3254635),

AIC: 988.2667; p <.0001

Results (2):

- L1 variable:

The Dutch L1 participants ($M = 27.2500000$; $SD = 11.9500349$), so with Dutch as their native, home language and with only some passive knowledge of Frisian, performed significantly better than the Frisian L1 participants ($M = 22.3103448$; $SD = 11.1090399$),
AIC: 984.4684; $p = 0.0160$

Results (3):

- Gender variable:

The boys (M = 28.7678571; SD = 10.1012890) performed significantly better than the girls (M = 22.487179; SD = 12.300083),
AIC: 977.1222; p = 0.0022

Results (4):

- School variable:

There is no significant difference between PJA (M = 27.5600000; SD = 11.4270713), CSG (M = 22.153846; SD = 11.643684) and BGM (M = 24.3275862; SD = 11.9917924)

- PJA vs. Rest: p = = 0.7584

  CSG vs. BGM: p = 0.6350

- Variable school is excluded from the model and the rest of the calculations
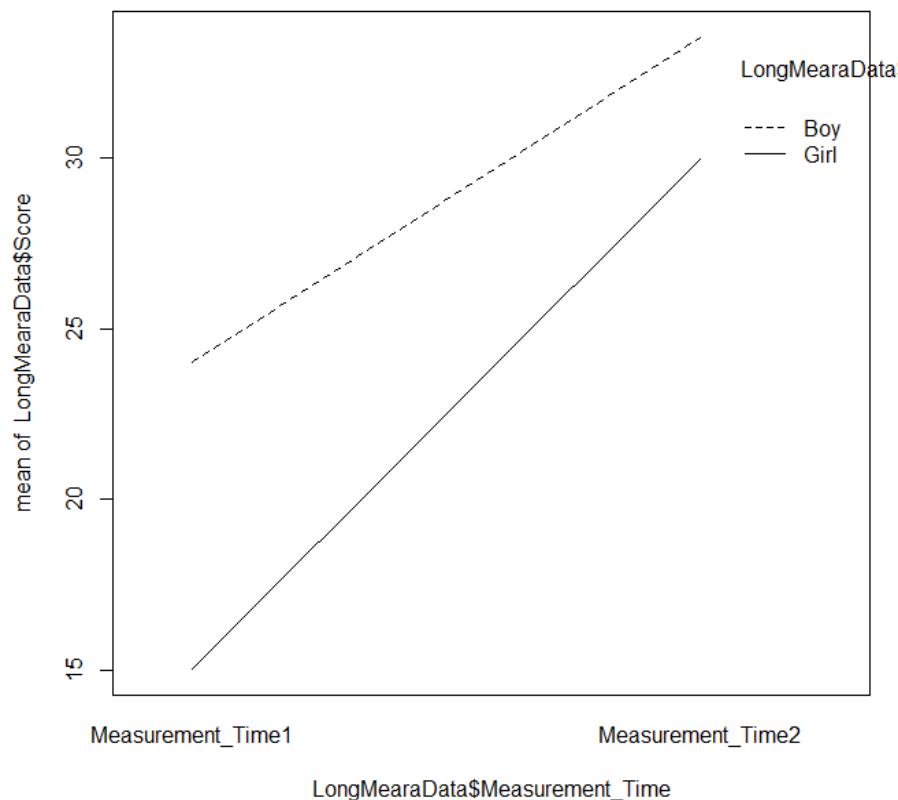
Results (5):

- Two-way interaction between Measurement_Time and L1:

The Dutch or Frisian L1 speakers did not perform significantly better than the other speakers at a particular measurement,

AIC: 979.1151; $p = 0.9330$

Results (6):

- Two-way interaction between Measurement_Time and Gender: a significant interaction between the measurement and the gender of the participant

- At both measurement 1 and measurement 2, the boys (M = 24.0000000; SD = 8.1012116, and M = 33.5357143; SD = 9.7505257) performed significantly better than the girls (M = 15.0256410; SD = 8.3586929, and M = 29.9487179; SD = 11.0642828)

- The boys at measurement 2 (M = 33.5357143; SD = 9.7505257) performed significantly better than the boys at measurement 1 (M = 24.0000000; SD = 8.1012116), and that the girls at measurement 2 (M = 29.9487179; SD = 11.0642828) performed significantly better than the girls at measurement 1 (M = 15.0256410; SD = 8.3586929)

- AIC: 976.3583; p = 0.0292

Results (7):

- The two-way interaction between L1 and Gender: a significant interaction between the participants' L1 and gender
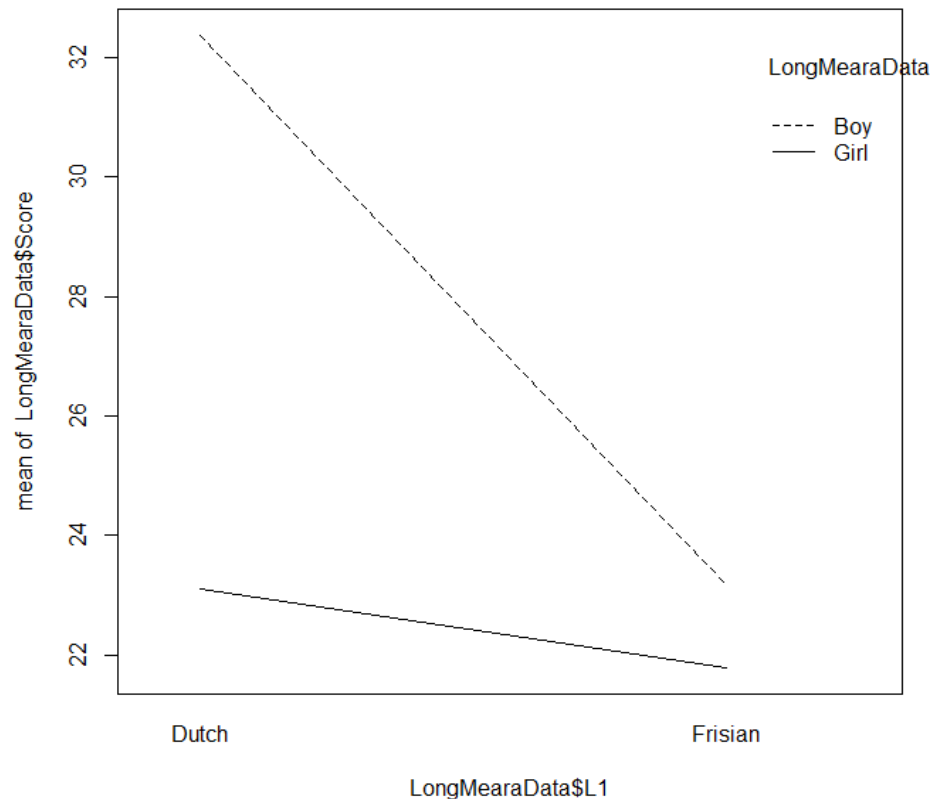
- Both the Dutch and Frisian boys (M = 32.382353; SD = 8.352153, and M = 23.1818182; SD = 10.1869962) performed significantly better than the Dutch and Frisian girls (M = 23.0952381; SD = 12.8666889, and M = 21.7777778; SD = 11.7451780)

- The Dutch boys (M = 32.382353; SD = 8.352153) and girls (M = 23.0952381; SD = 12.8666889) performed significantly better than the Frisian boys (M = 23.1818182; SD = 10.1869962) and girls (M = 21.7777778; SD = 11.7451780)

- AIC: 973.9534; p = 0.0358

Results (8):

- Three-way interaction between Measurement_Time, L1 and Gender:

The male and female Dutch and Frisian speakers do not seem to perform significantly better at measurement 1 or 2, AIC: 975.6377; $p = 0.5742$

Conclusion:

- The variables Time Measurement, L1 and Gender and the interactions Measurement_Time and Gender and L1 and Gender seem to significantly contribute to the model and to affect the students' acquisition of English vocabulary
- The variable school was not significant at all, which might be a positive fact
- Alternative analyses: Factorial ANOVA or Logistic Regression

Thank you for your attention!

Are there any questions?